

3.0 SCOPE OF WORK AND TOWER SPECIFICATIONS

3.1 OVERVIEW AND IMPLANTATION PLAN

- 3.1.1 The following work is to be performed by the contractor: Design, fabrication, erection and foundation installation for a 474 foot overall height guyed tower 478 feet to the top of the lightning arrestor, extendible to 550 feet (Sabre Model 4400 SRWD).

The tower is to be located at:

3-1/2 miles SE of Ottumwa, Iowa
5291 53rd St. Ottumwa, Iowa
40-57-41.0 N 092-22-14.0 W NAD83

- 3.1.1.2 Work will include a turnkey design, fabrication, and installation of the tower and related foundations.
- 3.1.1.3 Work shall include elevation and plan view drawings showing the geometry of the tower, guy wire arrangement, and sizes, size of structural members and equipment locations. The type of steel to be used in various portions of the tower and all pertinent design assumptions shall be clearly noted in the drawing or analysis submittal. A project critical path schedule for accomplishing the different phases of the work shall be provided in Microsoft Project format. The critical path diagram shall specify when the owner/tenant furnished equipment such as antennas and transmission lines will be required to be delivered on site. Timetable of the job from start to finish should be as documented in Appendix E attached. Iowa Public Television understands that there may be weather delays during this project. However, **AT NO TIME WILL IOWA PUBLIC TELEVISION INCUR ADDITIONAL COST FOR WEATHER DELAYS.**

3.2 ANTENNA ARRIVAL

The delivery date for the television broadcast antenna is 5 weeks after Iowa Public Television approves to commence the build. IPTV will work with the tower contractor to have the antenna and equipment on site at the proper time.

Please note: The above statement DOES NOT override any statements in the RFP regarding delay's caused by arrival of antennas and equipment. It is still the winning vendor's responsibility to coordinate the arrival of antennas and equipment with the owners and vendors of such equipment. **IOWA PUBLIC TELEVISION WILL NOT AT ANY TIME INCUR EXTRA COST DUE TO ANTENNA AND EQUIPMENT ARRIVAL DELAYS.**

3.3 TOWER

- 3.3.1.1 Tower Contractor shall provide a design-build turnkey installation statement of work for attachment to this contract for a 474 ft. (144.5 meters) height guyed multi-antenna tower complete with all ice shields, ice bridges and other specified accessories and appurtenances. The tower top shall be configured as a flat top straight face tower capable of supporting a top mounted AOL (aircraft observation light) lightning arrestor assembly and the face and leg side mounted broadcast antenna systems as described in the specification. The top of the AOL / lightning arrestor assembly at the top of the tower shall be 478ft. (145.7 meters) above ground level.

The new tower may be located 25 feet east of the existing tower at this site. All soil test boring locations reflect the relocation of the tower 25 feet to the East.

Outside platforms will not be required on this project.

The tower orientations of the new tower will be the same as the existing tower.

- 3.3.1.2 The Tower Contractor's areas of responsibility include design, fabrication, and erection of the tower structure, tower foundations and anchors, transmission line ice bridge and its foundation, platforms, ice shields, antenna supports/mounts, antenna feed line supports, climbing facilities, dampers, lights, electrical, grounding, and fencing along with any other auxiliary items described in this specification. In addition, the Contractor is responsible for the installation of all antennas and associated transmission lines along with ice shields and Ice Bridge for protection from ice and other falling objects as described in this specification. The responsibility of installing transmission lines shall extend from the output of the patch panel, or broadcast equipment as indicated, in the transmitter building to the input of the antennas. The responsibility of installing conduits and wiring shall extend from the appropriate internal electrical panels to the top of the lightning arrestor. The Owner reserves the right to exclude specific portions of the overall described job responsibilities if felt to be in the interest of the Owner.

The tower contractor will be responsible to provide a complete turn key tower facility. In some cases the equipment that is to be installed on the tower will not all be the property of Iowa Public Television and therefore will be beyond our control as to exactly what small parts will be provided. It is our belief that in most cases wall feed through(s) will be provided with the transmission line BUT if the feed through(s) are not provided it will be the tower contractor's responsibility to provide them and any other small parts needed to complete the project. The building provided should have an existing egress point for the various runs of heilax, BUT if it does not the tower contractor will have to cut a hole in the wall to install the heilax.

- 3.3.1.3 The Owner will provide access to the guy paths and the tag line path. If site clearing is required or if additional roadway material is needed, it shall be provided by the Tower Contractor. The Tower Contractor shall be responsible for erosion control and

protection of designated wetland areas and shall be liable for any un-permitted encroachment into jurisdictional areas.

- 3.3.1.4 The Contractor will be responsible for the official site survey.
- 3.3.1.5 Before construction of the new tower the tower contractor will be responsible for the demolition of the existing tower. All antennas and appurtenances on existing tower are obsolete and will be included in the demolition of the tower. The tower contractor will be responsible for disposal of the old tower and all associated scrap material. The existing tower shall be demolished without climbing or dismantling by normal gin pole techniques. It has been determined that the old tower is unsafe to climb due to rust and bullet holes.
- 3.3.1.6 The Tower Contractor is responsible for the removal of the existing tower guy points and antenna base foundation down to 4 feet below grade.

3.4 REQUIRED SUBMITTALS

- 3.4.1 Prior to "Notice to Proceed" from the Owner the Tower Contractor shall have their designs approved by the Owner's Engineer. Upon request, the Tower Contractor shall submit one (1) set to the Owner and one (1) set for approval to the Owner's Engineer of the following documents for review.
 - a. Final elevation and plan view drawings of the tower in sufficient detail to indicate all necessary structure details for a structural design review. All details concerning wind and weight loadings, including feed line and other appurtenance loadings used in the design shall be provided. Include all member sizes, material grades, yield, or breaking strengths necessary for complete verification of all structural items for this project. This shall include tower design notes, calculations, along with complete computer analyses verifying the structure design.
 - b. The Tower Contractor shall submit to the Owner and the Owner's Engineer one (1) set each of the foundation design, calculations verifying the design, specifications, and construction drawings.
- 3.4.2 The Tower Contractor shall receive in writing the "Notice to Proceed" by the Owner once all conditions are finalized, contracts in place, and Owner is prepared to start the project as specified.
- 3.4.3 Prior to delivery of the tower steel to the tower site, the Tower Contractor shall submit to the Owner and the Owner's Engineer one (1) set each of the tower erection drawings include lighting drawings, ice shield details, transmission line details, grounding details, antenna mount details along with complete hardware lists, and the proposed erection timeline in hardcopy and electronically in the Microsoft Project format.
- 3.4.4 One (1) set of unreduced, reproducible copies of all as built design, construction, erection and shop fabrication drawings covering all aspects of the project shall be delivered to the

Owner and shall be a prior condition to final payment being made to the Tower Contractor. Mylar reproductions shall be furnished for all documents larger than 11"x17". Copies of mill certificates attesting to the chemical and physical properties of the guy strand and tower leg material shall be included in this submittal. Complete documentation on large solid round leg steel items specified in 6.2.4 and 6.2.5 shall be included.

- 3.4.5 Copies of computer-generated drawings shall additionally be furnished to the Owner formatted in DXF or DWG, AutoCAD 14, or higher.
- 3.4.6 Two (2) copies of a complete preventive maintenance plan, which is to include equipment operations manuals, shall be delivered to the Owner and shall be a prior condition to final payment being made to the Tower Contractor.
- 3.4.7 All documentation required by this contract is to be provided in hard copy and in electronic form.
- 3.4.8 The Tower Contractor shall furnish to the Owner a notarized certificate which states the tower's design parameters and that the structure meets all its intended applications. The certificate shall be attested to by the company president and all key personnel involved in the project such as chief engineer, engineer responsible for fabrication, shop superintendent and QA manager. Typed names and titles shall accompany all signatures.

3.5 SITE CONDITIONS

3.5.1 Site Survey

- 5.1.1 A current Site Plan for the Ottumwa Translator Broadcast Facility by Iowa Public Television is provided in Appendix B.
- 5.1.2 The Tower Contractor shall employ a registered land surveyor, licensed by the State of Iowa, to layout, stake and install work hubs for use in establishing the location, alignment, and elevation of all foundations. The survey work is to be accomplished prior to any foundation excavation. The surveyor shall provide signed and sealed documentation of the "as built" location, alignment, and elevation for all foundation work points. Owner reserves the right to have independent verification.
- 5.1.3 The Tower Contractor shall trim trees and make all arrangements to move power wires as needed to allow contractor's equipment access to the site.

3.5.2 Geotechnical Report

In Appendix C, the Owner provides a Geotechnical Engineering Services Report for the site. This report is provided for the Tower Contractor's convenience and the information is for the Tower Contractor's interpretation. The Tower Contractor shall be responsible for any conclusions to be drawn from this information. If the Tower Contractor prefers not to assume such risk, the Tower Contractor shall employ experts to gather and analyze additional geotechnical information.

3.5.3 Erosion Control

- 5.3.1 The Tower Contractor shall be responsible for the installation and maintenance of all erosion control devices as may be required. Failure to maintain such devices may result in imprisonment and/or severe civil penalties. Any fines, penalties or legal fees associated with a failure to maintain adequate erosion control during this project are to be the sole responsibility of the Tower Contractor.
- 3.5.3.2 Upon completion of the project and prior to final acceptance, the Tower Contractor shall seed all denuded areas within the Tower Contractor's limits of construction. All erosion control devices are to be removed upon stabilization of all denuded areas. Final payment will not be released until the requirements of this subsection have been satisfactorily completed.

3.6 TOWER SPECIFICATIONS

- 3.6.1 The design, manufacture, and installation of the tower and auxiliary equipment shall meet or exceed applicable local and state building codes, all applicable industry standards and government rules and regulations, to include, but not be limited to the following:
- 3.6.1.1 ANSI/TIA/EIA-222-F "Structural Standards for Steel Antenna Towers and Antenna Supporting Structures". *Note: IPTV has chosen EIA/TIA 222F as a minimum requirement. If this test is used, and design changes made, IPTV will NOT be responsible for the changes, costs and liability of the structure.*
- 3.6.1.2 American Institute of Steel Construction (AISC); Manual of Steel Construction, Allowable Stress Design, Ninth Edition.
- 3.6.1.3 Federal Aviation Administration (FAA); Advisory Circular AC 70/7460-1J. "Obstruction Marking and Lighting"
- 3.6.1.4 American Welding Society (AWS);
ANSI/AWS D1.1-95 "Steel Structural Welding Code"
- 3.6.1.5 American Concrete Institute (ACI);
ACI 301 Standard Specifications for Structural Concrete for Buildings.
ACI 318-95 Building Code Requirements for Structural Concrete and Commentary (ACI 318R-95)
ACI 336.1-94 Standard Specifications for Construction of Drilled Piers
- 3.6.1.6 Drilled Shafts Publication by the Federal Highway Administration HWA-HI-88-042, & ADSC-TL-4, August 1988 "Construction Procedures and Design Methods"
- 3.6.1.7 Specifications for Post-Tensioning Materials for Pre-stressed Rock Anchors and Soil Anchors; Post Tensioning Institute "Post-Tensioning Manual – latest edition.
- 3.6.1.8 National Fire Protection Association;
ANSI/NFPA70 National Electric Code 1996

- 3.6.1.9 Department of Labor, Occupational Safety, and Health Administration;
1997 29 Code of Federal Regulations Part 1910
- 3.6.1.10 Department of Labor, Occupational Safety and Health Administration 29 CFR
PART 1910 and PART 1926 (latest edition)
- 3.6.1.11 ANSI/TIA-1019 "2004 Structural Standards for Steel Gin Poles Used for
Installation of Antenna Towers and Antenna Supporting Structures"

3.6.2 Tower Design and Fabrication Requirements

- 3.6.2.1 It is the intent of the Contract that the Tower Contractor shall design, manufacture and erect a 474 foot overall height guyed tower, 478 feet to the top of the lightning arrestor, multi-antenna guyed tower structure as required by these specifications. The tower shall be designed, fabricated, and erected in strict accordance with the state or local building code having jurisdiction and, as a minimum, to meet the requirements of the ANSI/TIA/EIA-222-F Standard for a basic wind velocity of 80 mph with no ice and also 69.3 mph with 1/2" radial ice.
- 3.6.2.2 The tower mast shall have a minimum face width of 3 feet 4 inches leg center to leg center, with guy anchor points in each of three directions, 120 degrees apart. The tower shall be designed to support the equipment listed in Section 7 of these Specifications.
- 3.6.2.3 The tower members shall be of all solid steel. The vertical (leg) members shall be of solid rounds. Vertical (leg) member end connections shall be milled or cut to a high degree of precision to allow for full bearing across the leg or the combination leg and flange of mating parts.
- 3.6.2.4 Steels selected for structural use shall preferably be ASTM designated structural steels as listed in Table 1 of the AISC Manual of Steel Construction - 9th edition. Steels with yield strengths exceeding the applicable limits of member size as listed in the table shall be accepted only by special qualification suitable to the Owner. ASTM A572 (Fy = 50,000 PSI minimum yield strength) may be used with a 50,000 PSI minimum yield strength, above 4 inch in size, with the acceptance of the mill along with verification by mill certificate. For any other steels outside of Table 1 completion of a. thru f. below will apply along with special acceptance of the Owner.
 - a. The steel mill producing the solid round leg material shall be required to provide a process flow chart or diagram. This document shall contain process details related to the production of the steel. Such items as the rolling tolerances per bar size purchased, bar cooling procedures, straightening methods and any heat treatment processing parameters, if performed, shall be included. Prior to production of any material, the Owners representative must approve the information provided in this document.
 - b. A description of the test scheme used to determine the tensile characteristics (including the 0.2% offset yield strength and percent elongation) of the material

must be agreed upon between the Owners representative and the manufacturer/fabricator of the tower. The test scheme shall include the number, size and orientation of the specimen, along with the location within the product from which all test coupons will be taken. Test results will be used to certify the steel's capabilities to meet the minimum physical requirements of the specification. The test scheme and requirement should be submitted to and agreed upon by the steel mill producing the solid round leg material and the owner.

- c. Two sample areas per heat shall be taken with 0.505 longitudinal tensile specimens. Coupon location shall be across the bar section 1 inch below the surface, at the quarter point and in the center.
- d. Only bars straightened to the special straightness requirement of a maximum curvature of 1/8 in any 5 feet shall be used as tower leg members.
- e. A set of welding tests completed on a representative sample of bars, including the largest bar size used, shall be qualified. Qualification shall include a metallurgical investigation, by the Owners metallurgical engineer, with an evaluation report on the welded steel areas taken from coupons cut from samples that have not been galvanized and on samples after galvanizing. This procedure is to help verify that the final product will be fabricated with an adequate, documented process as well as an adequate hot dip galvanizing process.
- f. An adequate documentation quality assurance program suitable to the Owners representative will be required.

3.6.2.5 This structure shall have members of hot-dipped galvanized steel after fabrication in accordance with ASTM 123. All hardware shall be hot dip galvanized in accordance with ASTM 153. All auxiliary components for the tower such as feed supports, bridges, antenna mounts, ice shields, ladders, walkways, etc. shall be of hot dip galvanized finishes, or equal. The welding and galvanizing procedure for solid rounds 5 inches and greater in size shall be qualified by acceptable test samples provided to and approved by the Owners selected metallurgical engineer. Alternate coating systems may be submitted for the Owner's consideration of acceptance, and may be subject to special tests required by the Owner. A documented quality assurance program shall be required for the hot dip galvanizing and/or special coating process.

3.6.2.6 All structural bolted connections shall utilize ASTM A325 Type I high-strength steel bolts and shall be hot-dipped galvanized in accordance with ASTM A153. All fasteners shall have ASTM A194 Grade 2H galvanized nuts with ANCO type locking devices. All grating shall be fastened to support members by bolts with ANCO nuts or split lock washers with flat washers. Any deviations from these listed fasteners or methods will be allowed only by written approval by the Owner's Engineer. Plans shall have connection methods clearly described with minimum acceptable torques listed and verified at the end of the tower erection.

- 3.6.2.7 Guy cables shall be ASTM A586 Class A galvanized structural strand with factory attached ASTM A148 fittings. All guy cables shall be pre-stressed and proof loaded after fabrication. The closed strand bridge sockets shall have 72" take-ups. Fine threads are not to be used on the closed strand bridge socket take-ups. Cotter pins for the open strand sockets shall be AISI Type 305 or Type 316 stainless steel. A corrosion-retarding agent (such as Pre-Lube 19HV, manufactured by Grignard Company, Inc. of Port Reading, New Jersey). For cables 1 inch or less in size wire strand can be Extra High Strength (EHS) meeting the ASTM A475 Standard and connected with Preformed Line Products performs. Other type of cables must be listed as alternates with technical details provided and may only be used with special acceptance by the Owner. UHS guy cables meeting the requirements of ASTM A586 Class "A" galvanized structural strand may be used in the tower design. Details conforming to reasonable proper articulation at both ends of the cable will be required. A prelub coating over the complete guy is acceptable.
- 3.6.2.8 The tower shall be furnished with members to support vertical and horizontal flexible transmission line runs according to the manufacturer's recommendations. Supporting the flexible lines on the tower legs, the strobe conduit, the platform power conduit, or the platform signal conduit is not acceptable. Contractor shall provide structural attachments for all specified transmission lines in accordance with manufacturer specifications. If lines are attached to the structural girders or diagonal tower members the effects of both axial and bending stresses shall be considered in accordance with Chapter H (Combined Stresses) of AISCS.
- 3.6.2.9 Hole sizes for all internal mast member connections shall be in accordance with AISC (1/16 inch maximum over the bolt size). Design and fabrication precision of all tower members shall be such that it can be erected in the field by trained crews without the use of supplementary field processes such as welding, drilling, cutting, burning, grinding, or reaming. If any loose or bowing members are found in the final assembly in the field, only repairs suitable to the owner's representative will be allowed. The practice of drilling oversized holes or slots in order to accommodate connection of members will not be allowed.
- 3.6.2.10 The tower shall be designed and constructed such that trained crews without the use of supplementary field processes such as welding, drilling, cutting, burning, grinding, or reaming, can erect it in the field. It shall also be designed to take into account erection forces to be used. This shall be coordinated with the installing Contractor. Minimum tension capacities of the tower leg connections shall be as follows:
- 0 - <4 inch S.R. 50% member compression capacity
 - 4 - 6 inch S.R. 50% to 33%
 - 6 inch and above 33% to 432 kip

- 3.6.2.11 The Tower Contractor shall have an in-house structural steel fabrication quality control program that meets or exceeds the requirements for Category II Certification as set forth by the AISC Quality Certification Program.
- 3.6.2.12 It is the Tower Contractor's obligation to provide complete project design drawings, structural and electrical, signed and sealed by a qualified registered professional engineer with a valid license to practice in the State of Iowa. The fabrication must be under the direct supervision of a qualified registered professional engineer experienced in the construction of broadcast towers, and with exceptional understanding of critical structural aspects of tower design and manufacture.
- 3.6.2.13 A complete tower design and structural analysis shall be submitted prior to start of work. Revisions in this design shall not be made without the approval of the Owner. Along with the structure analysis the following information shall be provided:
- a. A plan view of the structure showing overall height, tower face width, guy anchor locations, and position of appurtenances included in the design shall be provided.
 - b. A sketch showing the layout of transmission lines, conduits, and similar linear appurtenances shall be provided. Their size along with their location within or around the tower structure shall be specified. Lines calculated in the solidity ratio of the tower shall be specified, otherwise they shall be considered as linear appurtenances, (CaAa), for wind calculation purposes. Wind blockage of transmission lines, shall be justifiable and all blockage assumptions shall be clearly documented in the report of the structural analysis. Along with the designers wind loading criteria and assumptions, the tower shall be capable of meeting the specified codes and standards with loadings as described in Sections 3.7.2.1 as CaAa loadings. Reductions in tower member wind shielding shall not be considered with these CaAa loadings.
 - c. Details of the sizes of all tower members and guy wires shall be provided. The specific grades of materials or specified minimum yield strengths shall be provided for all main structural members.
 - d. Preliminary base and guy anchor foundation design details shall be provided.
 - e. **ALL TRANSMISSION LINE RUNS HAVE TO BE INSIDE THE TOWER;** however, conduit runs may be mounted on the outside face.
- 3.6.2.14 Owner may elect to have the Owner's Engineer conduct an independent static analysis on winning Tower Contractor's submitted tower design. Should the static analysis of the Tower Contractors design require modifications to the tower, any costs associated with such modifications shall be the responsibility of the Tower Contractor. Disagreements in the results of the Owner's Engineer and Tower Contractor's analyses shall be resolved by a mutually agreed upon qualified professional engineer acting as a third party. The Owner and the Tower Contractor shall share the cost of the third party analysis equally.

- 3.6.2.15 Owner may elect to have the Owner's Engineer conduct an independent dynamic analysis on winning Tower Contractor's submitted tower design. Should the dynamic analysis of the Tower Contractors design require modifications to the tower, any costs associated with such modifications shall be the responsibility of the Tower Contractor. Disagreements in the results of the Owner's Engineer and Tower Contractor's analyses shall be resolved by a mutually agreed upon qualified professional engineer acting as a third party. The Owner and the Tower Contractor shall share the cost of the third party analysis equally.

3.6.3 Tower Erection and Construction Tolerances

- 3.6.3.1 The Tower Contractor, or the designated Erector who has been approved by the Owner, shall provide the necessary qualified labor and sufficient equipment for the successful erection of the tower and the equipment mounted thereon as required by the Contract Documents. It shall be the Tower Contractor and Erectors responsibility to visit the tower site and be fully aware of all man made obstructions and topographical features of the proposed site. It will be the Tower Contractors responsibility to have all foundations properly staked out and verified that they are within existing property lines and easements.
- 3.6.3.2 Tower Erector shall be responsible to become familiar with all local building codes, ordinances, and licenses required for erecting the tower. Procedures shall be in accordance with the safety rules and regulations of the industry at all times.
- 3.6.3.3 The tower shall be erected in accordance with the construction drawings as provided and approved by the tower engineer. Under no circumstances should the drawings or tower construction be altered or modified without the specific permission of the tower engineer and the owner.
- 3.6.3.4 The Tower Erector shall obtain from the Tower Contractor a written plan of erection verifying that the installation procedure and equipment used on the tower will keep all structural tower members within their full allowable stresses as defined by AISC. Consideration should be given to the potential of a wire slipping in its gripping connection during the pulling of wires and up to the time the guy wires are properly positioned in their factory manufactured fittings. Any guidelines on the use of temporary guy lines or tower member supports shall be provided on a plan and clearly explained to the Erector.
- 3.6.3.5 Erection of the tower shall include off-loading of tower material and all components, assembly of the tower material and all components, erection of tower complete with all appurtenances, Transmission Bridge, ice shields, lights, climbing equipment, associated electrical work and miscellaneous components as noted in this specification.
- 3.6.3.6 The Tower Erector shall report any damaged tower components to the Tower Contractor and the Owner.

- 3.6.3.7 When handling tower sections, all possible precautions shall be taken to prevent the bottom of the section from contacting the ground surface. Mud, dirt and other foreign matter shall be washed off with potable water prior to erecting the steel.
- 3.6.3.8 Any damaged areas to galvanized or other finished surfaces shall be immediately corrected in a manner approved by the Owner.
- 3.6.3.9 Fit up problems and contemplated corrective actions shall be reported to the Tower Contractor and Owner. Field corrections or modifications including the replacement of any tower components shall not be implemented without prior approval from the Tower Contractor and Owner.
- 3.6.3.10 Erection of flexible coaxial cables shall include labor for installing grounding kits and hoisting grips per the manufacturer's recommendations.
- 3.6.3.11 The Tower Contractor shall provide its erection supervisors with all necessary precautionary notes and documentation covering the items outlined in Section 3.6.2.
- 3.6.3.12 The tower in its final erected position shall be surveyed for plumbness. It should be verified with a written report the amount of variation from true vertical throughout the tower mast. The tower should be plumb in regards to overall straightness, and straightness between any two points, within 1 part in 1000. The twist between any two elevations should not exceed 0.3 degrees in 10 feet, with the total twist not to exceed 3 degrees. If the tower exceeds these limits, the Tower Contractor and Owner shall be informed and the Owner's Engineer, if necessary, will determine an approved corrective procedure. Any costs associated with such corrective procedure shall be the responsibility of the Tower Contractor.
- 3.6.3.13 The erector shall verify to the Owners representative that guy tensions are within 5% (+ or – 5%) of the tower's approved design initial tensions. Final tensions will be accepted by the "tangent intercept method". Accurate charts shall be provided by the Tower Contractor at 10 degree F intervals, or more, from 30 to 90 degrees F. A variation greater than 5% may be acceptable if structural aspects of the tower are verified by computer analysis with the varied as-built tensions.
- 3.6.3.14 The final position of the guys at the design specified initial tensions shall leave turnbuckles, or closed bridge socket assemblies with room for additional reasonable tension adjustments and plumbing of the tower in the future.

3.6.4 Foundation Design, Construction and Testing

- 3.6.4.1 Foundations for the tower base, guy anchors, transmission Line Bridge, and low frequency vibration dampers are to be designed and constructed by the Tower Contractor or by the Owner's Foundation Contractor. Provisions for attaching erection rigging shall be provided at the tower base and each guy anchor. Provisions for tower climbers to clean mud and dirt off their feet at the tower mast base prior to climbing shall be provided. These items shall be designed by the Tower Contractor and embedment material provided to the Foundation Contractor.
- 3.6.4.2 Tower foundation types shall be selected and designed taking into consideration the long-term effects of sub-soil corrosion, and deterioration. In general, foundation anchor rods, steel piling, or other steel parts shall be designed so as to not to be placed in direct contact with the soil. A foundation design shall take into consideration reasonable methods to provide ultrasonic inspection of critical steel parts when practical.
- 3.6.4.3 Foundation design and installation is part of the Contractor's accepted Scope of Work. The Tower Contractor shall have the responsibility for correctness and accuracy of soil boring samples and / or other reports, which are provided by the Owner such as Appendix C. If the tower contractor chooses to use Appendix C they assume the responsibility for its correctness. If the Tower Contractor has any questions regarding the geo technical report and feel they need more information they are responsible to provide same. This may require additional geotechnical work payable by the Tower Contractor.
- 3.6.4.4 The Tower Contractor, or other approved Foundation Contractor, will be responsible to obtain the approval on the interpretation of any soil strength parameters used within their design from the Owner's selected Geotechnical Engineer. The Contractor will be responsible for all structural aspects of the foundations. When a geotechnical investigation report contains specific recommendations on the type of foundations to be used, this type shall be used in the quoted design. Alternative foundation types can be provided in addition to the specified design, but should be clearly marked as an alternative and have supporting documentation provided for its consideration.
- 3.6.4.5 The foundation design shall be limited to the following minimum deflection conditions at the top of the foundation:

Guy Anchors

¾ inch at 50 mph basic wind

2 Inches at full design wind and ice conditions

Mast Pier Top

1 inch maximum

¾ inch differential (maximum to minimum)

at full design wind and ice loadings

- 3.6.4.6 The Tower Contractor shall be responsible for locating the guy anchors to alleviate interference with other structures, roads or terrain features. The Tower Contractor shall have the official survey properly mark the location of all anchor work points with at minimum durable driven stakes. Each stake, or other acceptable visible marker, shall clearly identify its proper reference in relation to foundation plan drawings. For guyed towers a final survey of the exact location of each guy anchor point in reference to the tower mast base foundation shall be the responsibility of the Tower Contractor. This information shall be used for a final plan submitted to the Owner. It shall detail as built distances and elevations of all foundation work points, and be used by the Tower Contractor for exact guy lengths necessary for proper fit up.
- 3.6.4.7 The maximum permissible variation in the plan view location of the top of drilled piers is 3 inches. Vertical piers shall be installed with a maximum deviation from plumb of 1.0 percent of the pier length. The bottom elevations of foundations as shown on the Tower Contractor's construction drawings are to be taken as minimum depths allowed; the tolerance on the maximum depth of the drilled piers is plus one foot. The elevation of the tower bedplate shall be held to a tolerance of ± 1 inch; the bedplate shall be leveled to within 0 degrees - 10'-00" as measured in any two perpendicular directions.
- 3.6.4.8 It may be acceptable to spread spoil at the site if a written plan submitted to the Owner by the Contractor, is approved by the Owner as well as by local authorities. ***Note*** For any plan to spread spoil out at the site to be accepted it must include spreading only good quality soil. Bad or clay type soil must be removed from the site.
- 3.6.4.9 All backfill or approved site fill shall be placed with finished grades shown on drawings and arranged for positive drainage away from the structure by using a minimum grade of 6" in the first ten feet. Fill placement and grade shall take into consideration settlement potential and be arranged for overall site drainage suitable to the Owner. Any fill used in soil areas supporting foundation loads must be compacted as specified in the Geotechnical Report or to a minimum of 95% of the soil's standard Procter density as defined by ASTM D698.
- 3.6.4.10 The Tower Contractor shall retain a qualified independent testing agency to conduct concrete tests and perform inspections of the foundations at the site. The Contractor shall submit the testing agency's qualifications to the Owner, as well as this agency's detailed plan as to what will be tested, how the testing will be performed, items to be documented, methods of approval, and specific site inspections to be performed. The selection of the testing agency shall be subject to the approval of the Owner.
- 3.6.4.11 The Foundation Contractor shall contact the Geotechnical Engineer, and the Owner, in a timely fashion relating to items requiring inspection as described in the Geo Technical Investigation Report. The Geotechnical Engineer and the Owner shall be contacted in the event that excavation finds that soil conditions vary from conditions described in the Geotechnical Report, or in the event that alterations are to be made in the foundation design.

- 3.6.4.12 Final foundation Installation drawings shall be approved and stamped by an Iowa registered professional Engineer competent in foundation design. These drawings shall give the precise instructions for installation including all elevations, distances, sizes and tolerances.

3.6.5 Climbing facilities and Rest Platforms

- 3.6.5.1 An access ladder with an approved safety-climbing device meeting ANSI A14.3, with two complete sets of approved climbing harnesses, shall be provided. The ladder up the tower mast shall be outside. This ladder shall be at least 16 inches wide. The structural design of such ladders shall be capable of supporting a 250 lb point load at any point with factors of safety as outlined in AISC.

- 3.6.5.2 No Rest Platforms are required

3.6.6 Equipment Platforms and Associated Ice Shields

- 3.6.6.1 Equipment platforms are not required, however, if they are provided, they shall be designed to carry the anticipated loading of the antennas and their supporting equipment. Open grated areas shall be designed for a minimum loading of 100 PSF with AISC factors of safety.

- 3.6.6.2 Ice shields, including those over the various appurtenances, shall be designed to withstand a total uniform loading of 100 PSF, with factors of safety as defined by ASIC. The grating and/or other portions subject to deformation due to potential large point loads shall be designed for reasonable replacement in the field.

3.6.7 Transmission Bridge

- 3.6.7.1 The Tower Contractor shall furnish and erect a transmission line bridge, 14 feet in length. The transmission line bridge will be at least 24 inches wide. Top mounted grating for ice protection shall be provided and shall be designed for reasonable removal and replacement. Factors of safety shall be in accordance with AISC. This design shall be arranged for support of the number and type of transmission lines as described in this specification. Specific connections in accordance with line manufacturer requirements shall be provided with this structure. Drawings describing the arrangement of line placement with installation instructions shall be provided to the Owner for approval prior to fabrication. *NOTE* Ice shields and ice bridges shall be designed for 100 PSF loading with appropriate AISC factors of safety.

3.6.8 Tower Lighting, Electrical, and Painting

- 3.6.8.1 A Medium Intensity Strobe Light style tower lighting system, shall be furnished and installed by the Tower Contractor. The lighting system shall be located on the tower as indicated in FAA Advisory Circular AC70/7460-1K. This system shall conform to FAA Advisory Circular AC70/7460-1K, or the most current Advisory Circular, and any other applicable FAA document.

The Tower Contractor shall maintain the lighting system in good working order and indemnify Owner during construction and prior to Owner acceptance of tower. The Bid Documents shall specifically identify the supplier and manufacturer of the obstruction light system. The electrical drawings shall be signed and sealed, certifying compliance with state and local building codes, by a qualified professional engineer with a valid license to practice in the State of Iowa.

- 3.6.8.2 Reserved.
- 3.6.8.3 Suitable protection from falling objects shall be provided for the Medium Intensity Strobe Light enclosures.
- 3.6.8.4 The Medium Intensity Strobe Light enclosures shall be mounted in a manner that will permit them to be readily repositioned in order to provide access from within the tower for maintenance purposes.
- 3.6.8.5 A Medium Intensity Strobe Light shall be mounted on the tower top.
- 3.6.8.6 The tower lighting system shall have a complete remote control system that will, through contact closure, allow for complete control of the system and remote monitoring of every beacon and light on the tower. The manufacturer of tower lighting system shall provide all communications protocols necessary to allow Iowa Public Television to interface with and communicate with the tower lighting controller via a yet to be determined third party remote control system.
- 3.6.8.7 Deleted
- 3.6.8.8 Tower contractor shall be responsible for connecting and maintaining temporary tower lighting in accordance with all applicable state, local, and federal requirements during the construction process.
- 3.6.8.9 Tower contractor shall be responsible for electrical wiring to tower lighting; communication platforms (as required); and to the permanent electrical panel in the transmitter building; and other necessary electrical connections for the proper operation of the Owner's tower facility.

3.6.9 Grounding, Bonding, and Lightning Deterrent System

3.6.9.1 The Tower Contractor shall furnish the necessary material and labor to provide the total grounding system as detailed in Appendix A. The ground system shall be tested and documented by a method acceptable to the Owner. **Note: Underground cadwelds may not be covered until inspected by Owner's representative.**

3.6.9.2 The Tower Contractor shall furnish the necessary material and labor to install a lightning deterrent system on the top of the tower. The lightning deterrent system proposed by the Tower Contractor shall be fully described by words and drawings and shall cover applicable specifications as noted in Section 3.7.1.6.

3.6.10 Vibration Dampers

3.6.10.1 The Contract Documents shall specifically identify and describe, in words and/or drawings, the type and manufacturer of the various components of the damper systems to be used. The Tower Contractor shall install damper systems. Final drawings shall be provided detailing the damper systems along with their correct installation locations and procedures.

3.6.10.2 The tower shall be equipped with high frequency type guy dampers for all guy levels. The size and number shall be verified by calculation from the manufacturer.

3.6.11 Antenna Mounts

Mounts for antennas specified to be provided in Section 3.7 shall be designed for wind and ice loads as specified for the Tower Structure. Due consideration for antenna twist, sway, and radius of curvature, these requirements shall be the responsibility of the Tower Contractor. **Note: This structure shall be stiff enough to meet the TV antenna manufacturer's requirements in regards to structure twist and sway.**

3.6.12 Fencing

The Tower Contractor shall furnish the necessary material and labor to install 8 ft. tall, galvanized nine gauge, chain link security fence around each guy anchor. This fence may be triangular in shape with the point of the triangle facing the tower. An 8 ft. man gate shall be provided for access on all guy anchors and shall be provided on the side of the enclosure facing away from the tower..

The Tower Contractor will be responsible for demolition of the existing 30 x 60 x 8 foot fence that surrounds the tower base and transmitter building. The winning vendor will be responsible for building a new 40 x 80 x 8 foot fence around the new facility. The new fence must include a walk in gate and a gate large enough to accommodate a pickup sized service vehicle. Locations of gates are to be determined at time of construction..

3.6.13 Correction of Defective Work

3.6.13.1 In the event that anchor bolts, bed plates, anchor assemblies or any other embedded items are not set properly, or if any portion of the Tower Contractor's work is found to be defective, the Tower Contractor shall correctly reset the item or remedy the defect. The Tower Contractor shall bear all direct and indirect costs for such corrective actions.

3.6.13.2 Any corrective action contemplated by the Tower Contractor shall be submitted in writing to, and receive the approval of the Owner.

3.7 ANTENNAS and EQUIPMENT LOADING

3.7.1 The tower shall be designed to support the equipment listed below, along with their associated transmission lines. Details regarding this equipment will be attached to this document in Appendix D.

416-477 Feet

West face Iowa Public Television broadcast antenna
ERI Carina ALP24L4-HSOX-18
Feed Line = ERI HJ8-50B Air Dielectric Coaxial
Cable 3 1/8"

383-404 Feet

East Leg FBI VHF repeater antenna
Andrew DB264
Feed Line = Andrew LDF5-50A 7/8 heliax

365-373 Feet

East leg One Iowa Public Television receive antenna
Wade WL-7-13/DQ Quad Array
Down Line = TFC T10 750 semiflex cable jacketed

365 to 381 Feet

North West leg Two OATS - receive antennas
Wade WL-7-13/DQ Quad Array's
Down Line = 2 runs of 1/2 inch foam filled heilax

235 to 259 Feet

North West leg OATS - Transmit antenna
Scala Paraslot SL-8-3
Feed Line = Andrew 2 1/4" Air Core heilax

150 to 152 Feet

East Leg OATS - Off air antenna
Sitco MU12-1-14~15
Down Line = 5/8" foam core heilax

3.7.1.1 A TRW D2 medium intensity white strobe lighting system with beacon cable, designed in accordance with FCC and FAA specifications. Verify the most current FAA AC for lighting furnished and installed by the Tower Contractor. Ice shields shall be provided above each beacon assembly located on the tower mast.

3.7.1.2 Deleted

3.7.1.3 Outside ladder access for the full height of the tower with an ANSI approved safety climbing device. Furnished and installed by the Tower Contractor.

3.7.1.4 Deleted

3.7.1.5 Lightning protection and Grounding of 5 Ohms or less shall be provided by the Contractor. Details regarding required grounding can be found in Appendix A of this document.

3.7.1.6 Contractor to design, construct and install ice shields over all antennas and strobes and necessary to protect these devices from falling ice and other material.

3.7.2 Future Equipment

The equipment listed at 3.7.1 parts (a, c, d, etc) can be considered as being mounted on the tower directly after tower erection. The Tower Contractor is also responsible for providing the necessary holes, access and means for ease of installation of all other specified antennas and feed equipment. The tower and transmission line bridge drawings shall show the intended location of all future equipment and lines.

4.0 PRICING

The turnkey price quoted for the performance of the work is delineated per the spreadsheet below and associates all the following aspects of the work:

- a. Design, furnish, and fabricate all material
- b. F.O.B. the tower site.
- c. Foundation construction.
- d. Tower erection.
- e. Erection of antennas, transmission lines, ice shields and Ice Bridge which are designated in Section 3.7 to be erected and placed in service by the Tower Contractor.

	COST NOT TO EXCEED
Preliminary Work	\$ 3,513.00
Tower Removal	\$ 31,611.00
Foundation Install	\$ 26,611.00
Tower Materials (Initial 474 ft only)	\$ 96,859.00
Tower Erection (Initial 474 ft only)	\$ 29,262.00
Antenna & T-line Install	\$ 26,889.00
8 ft Fencing around compound 65' x 65' & all anchors 34' x 14'	\$ 19,311.00
Grounding	\$ 4,737.00
Tower freight (Initial 474 ft only)	\$ 2,442.00
Anchor Freight	\$ 447.00
TOTAL COST NOT TO EXCEED:	\$ 241,682.00

Reference Proposal No. 06-2007-VEM-RI dated Nov. 8, 2005 attached.

IN WITNESS WHEREOF, the parties have executed this contract as of the date of execution by the State of Iowa below.

**For the State of Iowa
And Iowa Public Television:**

Name: William T. Hayes

Title: Director of Engineering

Signature: [Signature]

Date: 12/1/05

For Sabre Communications Corporation:

Name: SCOTT AALFS

Title: EXECUTIVE VICE PRESIDENT

Signature: [Signature]

Date: 11/22/05



Guyed and Self-Supporting Towers Monopoles
HF Antenna Systems and Turnkey Installations

November 8, 2005

IOWA PUBLIC TELEVISION
Hoover State Office Building
Des Moines, IA 50319

Attn: Ms. Ashley Super
(515) 281-7073

Dear Ms. Super:

Per your recent request, please find following our revised quotation for a 474' extendible to 550' Sabre Model 4400 SRWD guyed tower for the Broadcasting Tower at Ottumwa, Iowa

If you have any questions or require further information, please feel free to contact me at (515) 963-1288 or the Estimation Supervisor, Pam Washburn, at (800) 369-6690, ext 161.

Sincerely,
SABRE COMMUNICATIONS

A handwritten signature in cursive script that reads 'Verle Miller'.

Verle Miller
Central Sales Manager

Enclosure: Per Above

VEM: pw



Guyed and Self-Supporting Towers Monopoles
HF Antenna Systems and Turnkey Installations

PROPOSAL

Prepared for: IOWA PUBLIC TELEVISION
Hoover State Office Building
Des Moines, IA 50319
Attn: Ms. Ashley Super

Proposal No.: 06-2007-VEM-R1
Date: 11/08/05 Page 1 of 6
Reference: 474' ext. 550' 4400 SRWD/Ottumwa, IA
FOB: Destination Payment Terms: Net 30

SABRE MODEL 4400 SRWD GUYED TOWER

Quantity of one (1) 474' extendible to 550' Sabre Model 4400 SRWD guyed tower

The tower will be triangular in design 3' - 8" on a face and consist of all solid welded 20' sections

The tower will have two (2) sets of anchors in each direction, 120° apart, with a 165' level guy radius and a 350' level guy radius.

The tower will be designed for a basic wind speed of 80 mph with 1/2" of radial ice in accordance with ANSI/EIA/TIA-222-F-1996 (reduction in wind speed will be considered when ice is applied)

The tower will be designed to support the following equipment:

	ANTENNA MODEL NUMBER (QTY)	RADOME		ELEVATION C.O.R.	TX. LINE SIZE & TYPE	FREQUENCY	AZIMUTH TO NORTH	ANTENNA MOUNT	MOUNT PROVIDED	
		YES	NO						YES	NO
1*	(1) SHPX-6AC3-SP-FM Antenna		X	492' - 550'	(1) 3"	N/A	Unknown	Leg Mount		X
2	(1) ALP24AL4-HSOX-18 Antenna		X	413' - 474'	(1) 3 1/8"	N/A	Unknown	Special Face Mounts	X	
3	(1) DB264 Dipole Antenna		X	383' at base of antenna	(1) 7/8"	N/A	Unknown	(1) 3ft Sidearm	X	
4	(1) WL7-13/DQ Yagi Antenna		X	372'	(1) TFC 110-750	N/A	Unknown	Pipe Mount	X	
5	(2) WL7-13/DQ Yagi Antennas		X	372'	(2) 1/2"	N/A	Unknown	PipeMount	X	
6	(1) 8' Grid Dish		X	361'	(1) 7/8"	6 GHz	Unknown	(1) Leg Dish Mount		X
7	(1) PR-950 Antenna		X	275'	(1) 7/8"	N/A	Unknown	Pipe Mount		X
8	(1) SL-8-3 Antenna		X	235' at base of antenna	(1) 2 1/4"	N/A	Unknown	(1) 3ft Sidearm	X	
9	(1) HDCA-5 Yagi Antenna		X	151'	(1) 5/8"	N/A	Unknown	Pipe Mount		X
10	(1) MU12-1-16-20 Omni Antenna		X	151'	(1) 5/8"	N/A	Unknown	Pipe Mount	X	

*These antennas cannot be installed until the tower has been extended.



Guyed and Self-Supporting Towers Monopoles
HF Antenna Systems and Turnkey Installations

PROPOSAL

Prepared for: **IOWA PUBLIC TELEVISION**
Hoover State Office Building
Des Moines, IA 50319
Attn: Ms. Ashley Super

Proposal No.: **06-2007-VEM-R1**
Date: **11/08/05** Page **2** of **6**
Reference: **474' ext. 550' 4400 SRWD/Ottumwa, IA**
FOB: **Destination** Payment Terms: **Net 30**

ITEM I TOWER MATERIALS (Initial 474' only) \$96,859.00

Materials to be provided include:

Complete tower steel and hardware (Anco nuts)
Complete guying system
Base material and standard deadman anchor arms (see notes)
Outside climbing ladder
Waveguide support ladder incorporated into three (3) faces (to support up to thirty-six (36) lines)
Special face mounts for the 447' elevation
One (1) 3' sidearm with two (2) tieback kits at the 383' elevation
Three (3) 4 1/2" O.D. pipe mounts and six (6) tieback clip kits at the 372' elevation
One (1) 3' sidearm with two (2) tieback kits at the 235' elevation
One (1) 4 1/2" O.D. pipe mount at the 151' elevation
Three (3) antenna ice shields – one (1) each at the 406', 375' and 261' elevations
Two (2) antenna ice shields at the 383' elevation
One (1) antenna ice shields at the 154' elevation
Required stabilizer
Required beacon mounts
Two (2) mid-point beacon mounts
Two (2) ice shields for mid-point beacons
DBI safety cable kit with two (2) harnesses (500')
One (1) horizontal ice bridge - 15' x 2' and five (5) 2' single run trapeze kits
Required high frequency guy dampers
One (1) lightning dissipation system
Eleven (11) 5/8" x 30' ground rods with couplers and 250' of 250 MCM copper ground wire
One (1) TWR (D2) Medium intensity strobe light system with beacon cable designed in accordance with
FAA and FCC specifications
P.E. certified tower profile and foundation drawings
Final erection drawings

ITEM II PRELIMINARY WORK \$3,513.00

ITEM III FOUNDATION INSTALLATION \$26,611.00

Install foundations based on (Team Service's) soil analysis provided to Sabre Communications Corporation.



Guyed and Self-Supporting Towers Monopoles
HF Antenna Systems and Turnkey Installations

PROPOSAL

Prepared for: **IOWA PUBLIC TELEVISION**
Hoover State Office Building
Des Moines, IA 50319
Attn: Ms. Ashley Super

Proposal No.: 06-2007-VEM-R1
Date: 11/08/05
Reference: 474' ext. 550' 4400 SRWD/Ottumwa, IA
FOB: Destination
Page 3 of 6
Payment Terms: Net 30

ITEM IV TOWER ERECTION (Initial 474' only) \$29,262.00

The following is included in the erection price:

Offload tower materials from truck and inventory
Erect tower steel complete
Install outside climbing ladder
Install special face mounts for the 447' elevation
Install one (1) 3' sidearm with two (2) tieback kits at the 383' elevation
Install three (3) 4 1/2" O.D. pipe mounts and six (6) tieback clip kits at the 372' elevation
Install one (1) 3' sidearm with two (2) tieback kits at the 235' elevation
Install one (1) 4 1/2" O.D. pipe mount at the 151' elevation
Install three (3) antenna ice shields – one (1) each at the 406', 375' and 261' elevations
Install two (2) antenna ice shields at the 383' elevation
Install one (1) antenna ice shields at the 154' elevation
Install required stabilizers
Install DBI safety cable kit with two (2) harnesses (550')
Install one (1) horizontal ice bridge - 15' x 2' and five (5) 2' single run trapeze kits
Install required high frequency guy dampers
Install one (1) lightning dissipation system
Install eleven (11) 5/8" x 30' ground rods and 250' of 250 MCM copper ground wire
Install lighting system

ITEM V ANTENNA AND TRANSMISSION LINE INSTALLATION \$26,889.00

Install one (1) ALP24AL4-HSOC-18 antenna and one (1) 3 1/8" transmission line at the 447' elevation
Install one (1) DB264 antenna and one (1) 7/8" transmission line at the 393' elevation
Install one (1) WL-7-13/DQ quad array antenna and one (1) T10-750 transmission line at the 372' elevation
Install two (2) WL-7-13/DQ quad array antennas and two (2) 1/2" transmission lines at the 372' elevation
Install one (1) SL-8-3 antenna and one (1) 2 1/4" transmission line at the 247' elevation
Install one (1) MU12-1-14-15 yagi antenna and one (1) 5/8" transmission line at the 151' elevation

ITEM VI FENCE \$19,311.00

Supply and install 65' x 65' x 8' high chain link fence around compound and 34' x 15' x 4' high chain link fence around anchors.

ITEM VII GROUNDING \$4,737.00

ITEM VIII DISMANTLE AND REMOVAL OF EXISTING TOWER \$31,611.00



Guyed and Self-Supporting Towers Monopoles
HF Antenna Systems and Turnkey Installations

PROPOSAL

Prepared for: IOWA PUBLIC TELEVISION
Hoover State Office Building
Des Moines, IA 50319
Attn: Ms. Ashley Super

Proposal No.: 06-2007-VEM-R1
Date: 11/08/05
Reference: 474' ext. 550' 4400 SRWD/Ottumwa, IA
FOB: Destination
Page 4 of 6
Payment Terms: Net 30

<i>TOWER FREIGHT TO WAPELLO COUNTY, IOWA (Initial 474' only)</i>	<i>\$ 2,442.00</i>
<i>ANCHOR FREIGHT TO WAPELLO COUNTY, IOWA</i>	<i>\$ 447.00</i>
<i>TOTAL AMOUNT (INITIAL)</i>	<i>\$241,682.00</i>

Appendix A

Grounding System

Requirements